

Claims

1. An ultra fine grain steel having a nitride layer, wherein the steel has a ferrite grain structure having an average grain size of 3 μm or less and the nitride layer is formed on a surface of the steel.
2. The ultra fine grain steel having a nitride layer as claimed in claim 1, wherein grain growth at a time of nitrifying is suppressed by precipitation of carbide or addition of a solid solute element or both of them.
3. The ultra fine grain steel having a nitride layer as claimed in claim 1 or claim 2, wherein the amount of C is 0.01 mass % or more.
4. The ultra fine grain steel having a nitride layer as claimed in any one of claims 1, 2, or 3, wherein at least one element selected from a group consisting of Mn, Cr, Mo, Ti, Nb, V and P is added.
5. The ultra fine grain steel having a nitride layer as claimed in claim 4, wherein the amount of Mn is 0.4 mass % or more.
6. The ultra fine grain steel having a nitride layer as claimed in claim 4 or 5, wherein the amount of P is 0.035 mass % or more.
7. The ultra fine grain steel having a nitride layer as claimed in any one of claims 4, 5, or 6, wherein the steel is a carbon steel and the total amount of Cr, Mo, Ti, Nb, and V is 0.1 mass % or less.
8. The ultra fine grain steel having a nitride layer as claimed in any one of claims 1, 2, 3, 4, 5, 6, or 7, wherein a fatigue limit is 1.6 times larger than Vickers hardness of a base material.
9. A molded part, a part, or a member which is formed from the ultra fine grain steel having a nitride layer as claimed in any one of claims 1, 2, 3, 4, 5, 6, 7, or 8.